

FIVE EARTHQUAKES IN THE LAST 50 KA IN THE NORTHWESTERN YAKIMA FOLD AND THRUST BELT, WASHINGTON

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The Yakima fold and thrust belt is a series of anticlinal ridges and synclinal valleys (and associated faults) in central Washington.

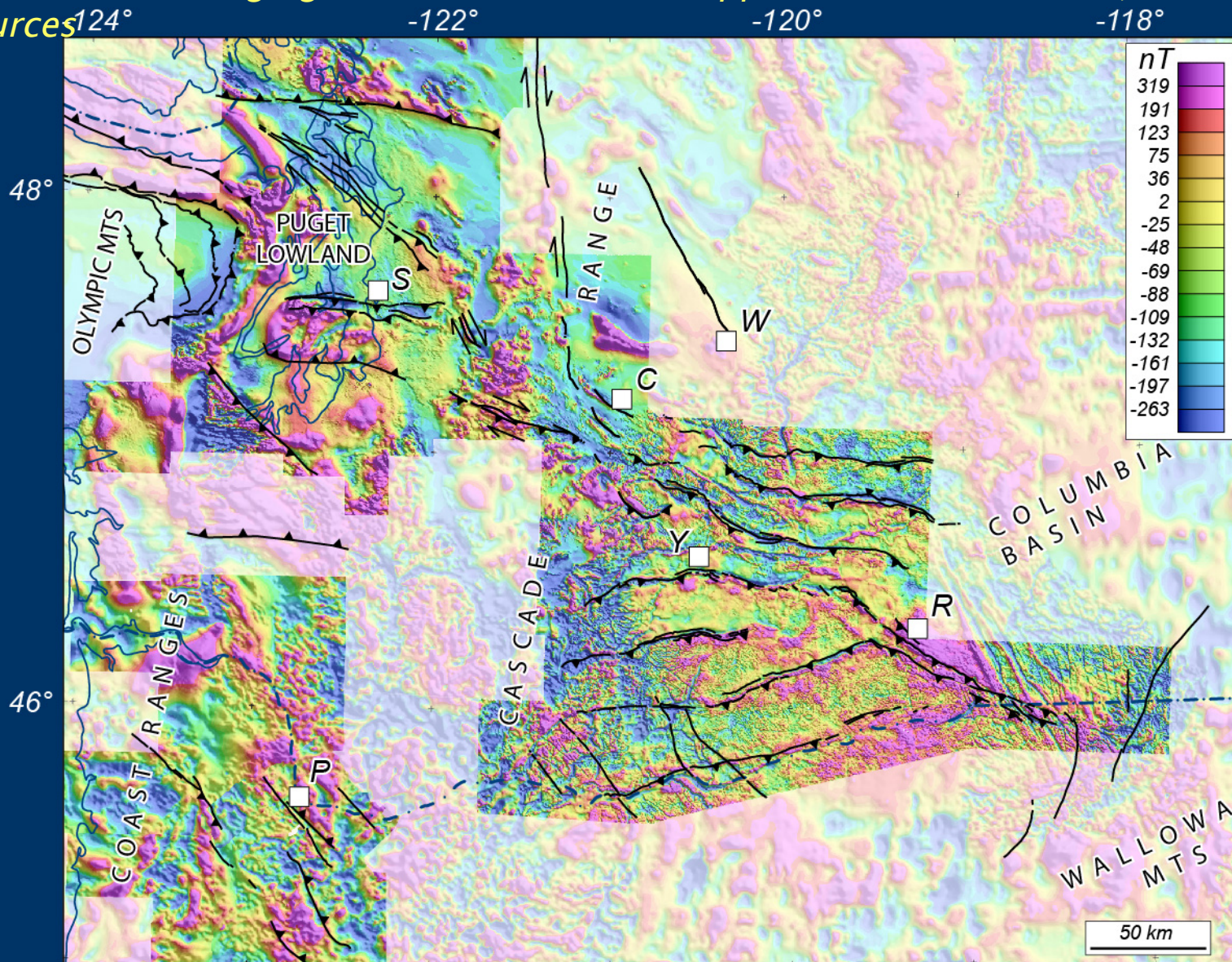
*Two PSHAs are underway at sites in the YFTB:
Mid-Columbia PSHA – six hydroelectric dams
Hanford PSHA – former plutonium production site*

Most of what we know about active faulting in the YFTB dates to the late 1970's and early 1980's – only a handful of studies since (2–3).

We began collecting high-resolution aeromagnetic and LiDAR data over parts of the YFTB in 2008 in an effort to identify active faults in the YFTB. Our efforts to date focus on Umtanum Ridge, with initial results just published in a 2011 JGR paper by Blakely and others.

High-Resolution Magnetic Surveys

Please go see Rick Blakely's talk (GP33B-05) Wends., Dec 7 at 2:40 PM
Session: Crustal Imaging With Potential Fields: Applications to Tectonics, Hazards, and Resources



View to the NE from Cleman Mtn across Wenas Valley to Umtanum Ridge

Wenas Valley

Umtanum Ridge

*Cleman
Mtn dip
slope*



46.9N

120.9W

120.8W

120.7W

46.8N

McCabe Place trench

Umtanum Ridge

Wenas Valley

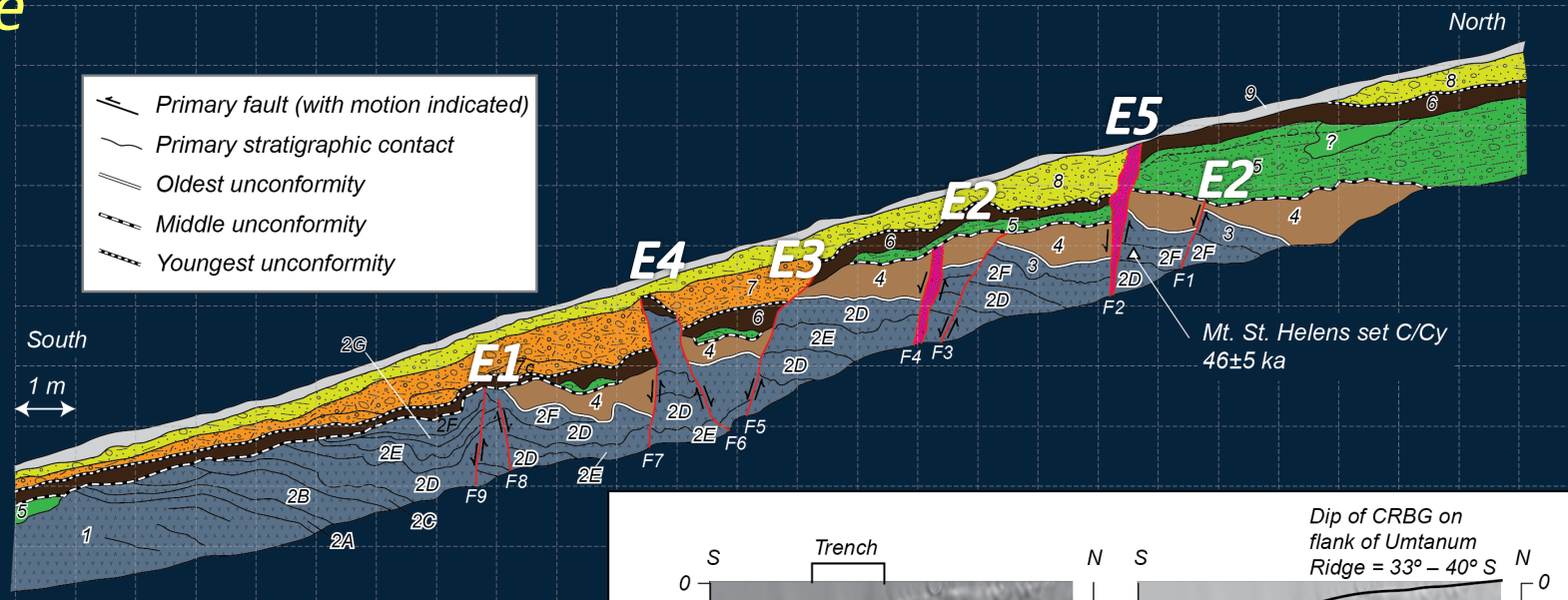
Cleman Mtn.

No data

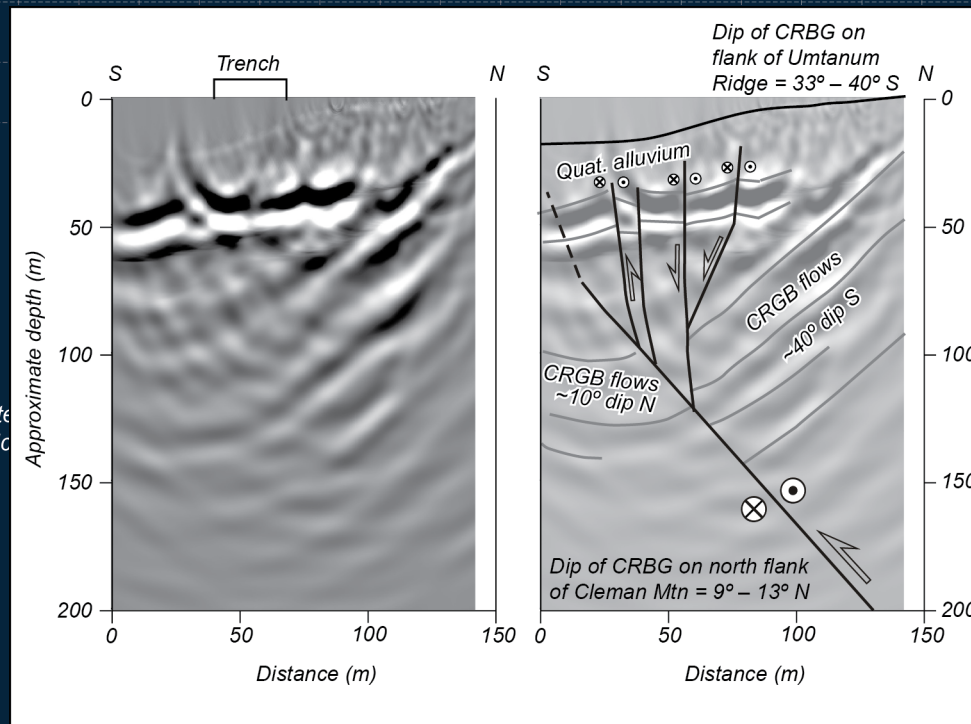
0 1 2 km



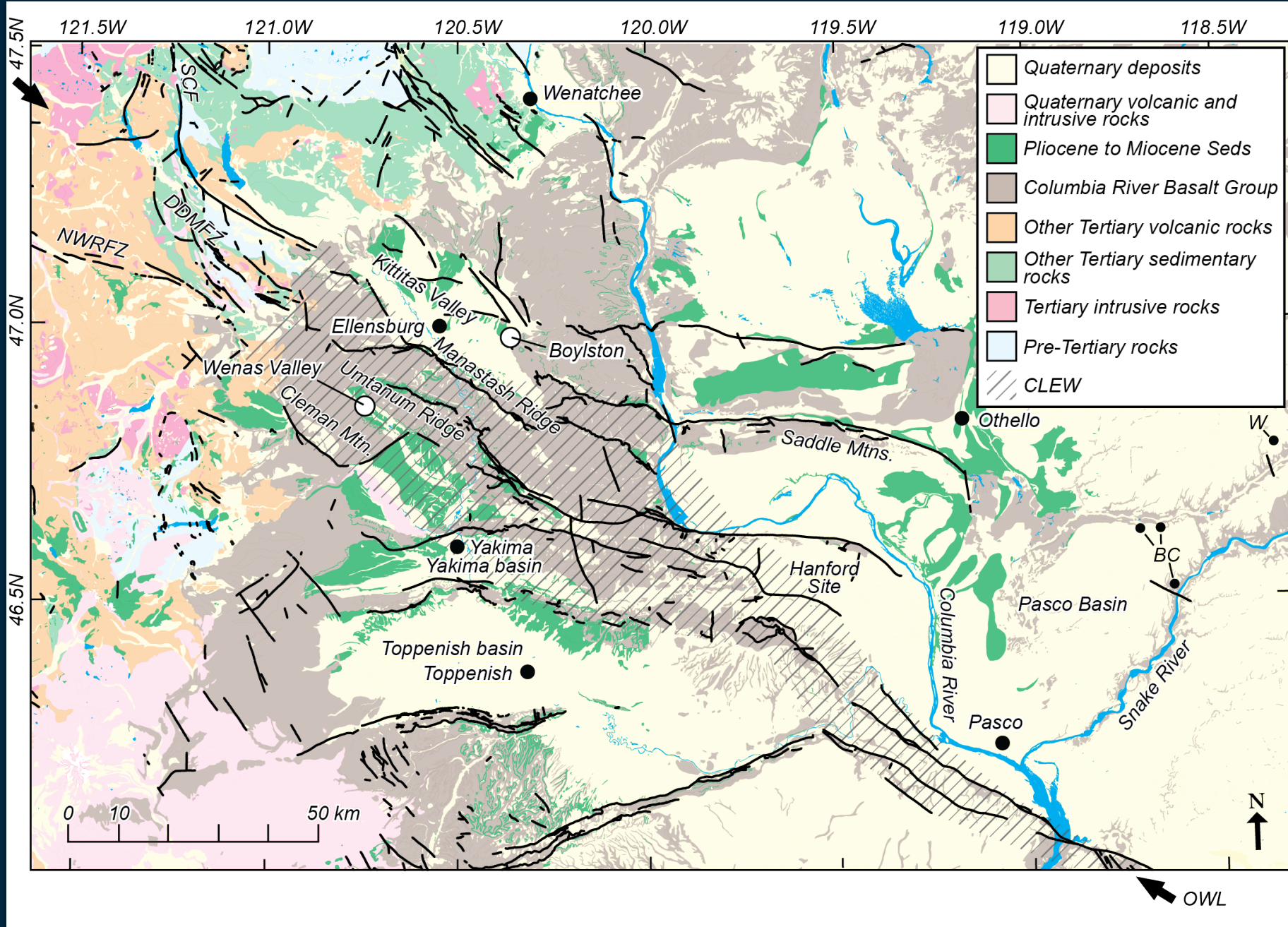
McCabe Place Trench Log –Wenas Valley, Umtanum Ridge



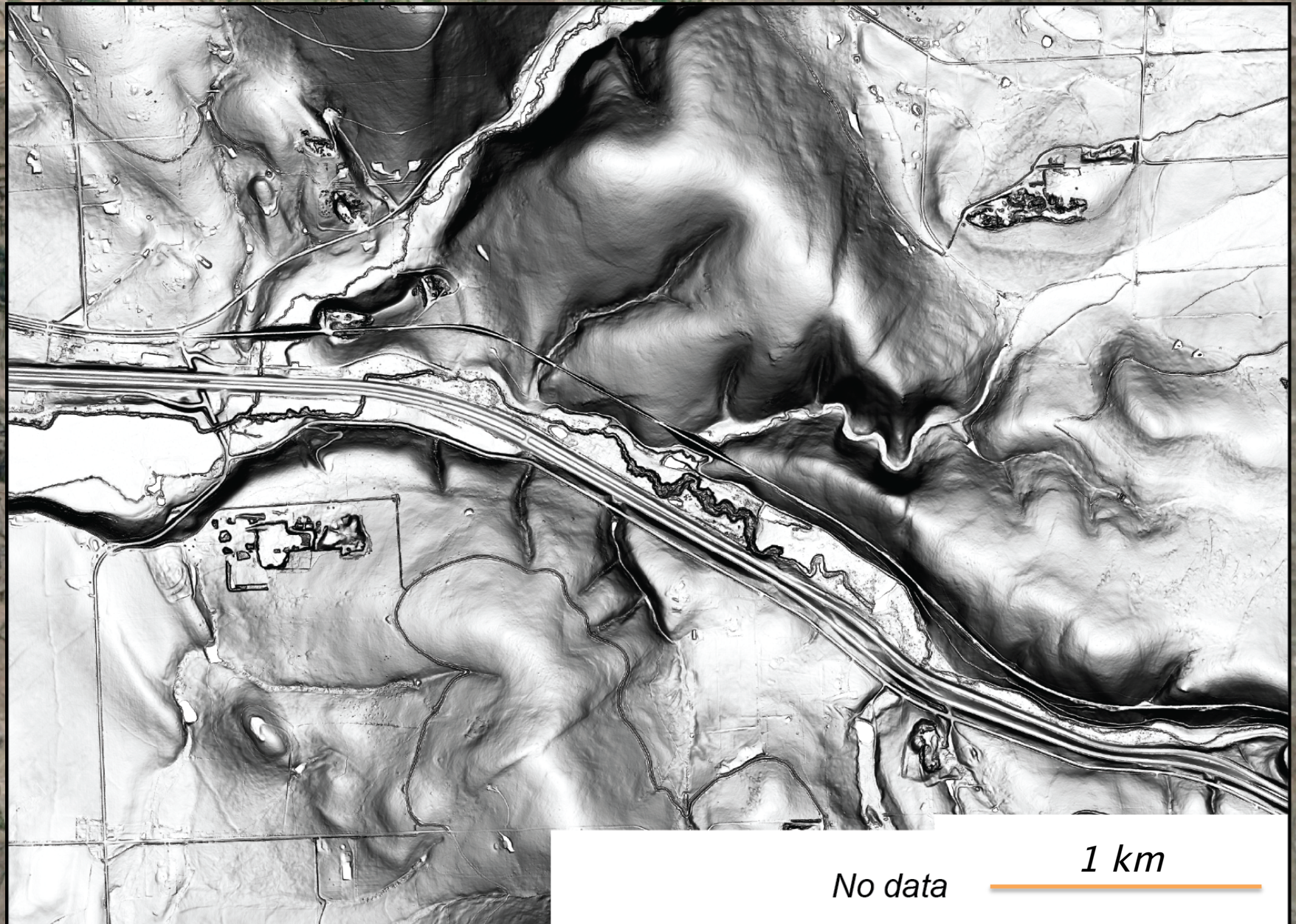
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|----|----------------------------|
| 1 | Sandy silt |
| 2A | Gravelly silty sand |
| 2B | Sandy silt |
| 2C | Gravelly silty sand |
| 2D | Sandy silt |
| 2E | Cobbly silty sand |
| 2F | Sandy silt with lapilli |
| 2G | Clay with pumice fragments |
| 3 | Sandy silt |







Fault scarp at Boylston

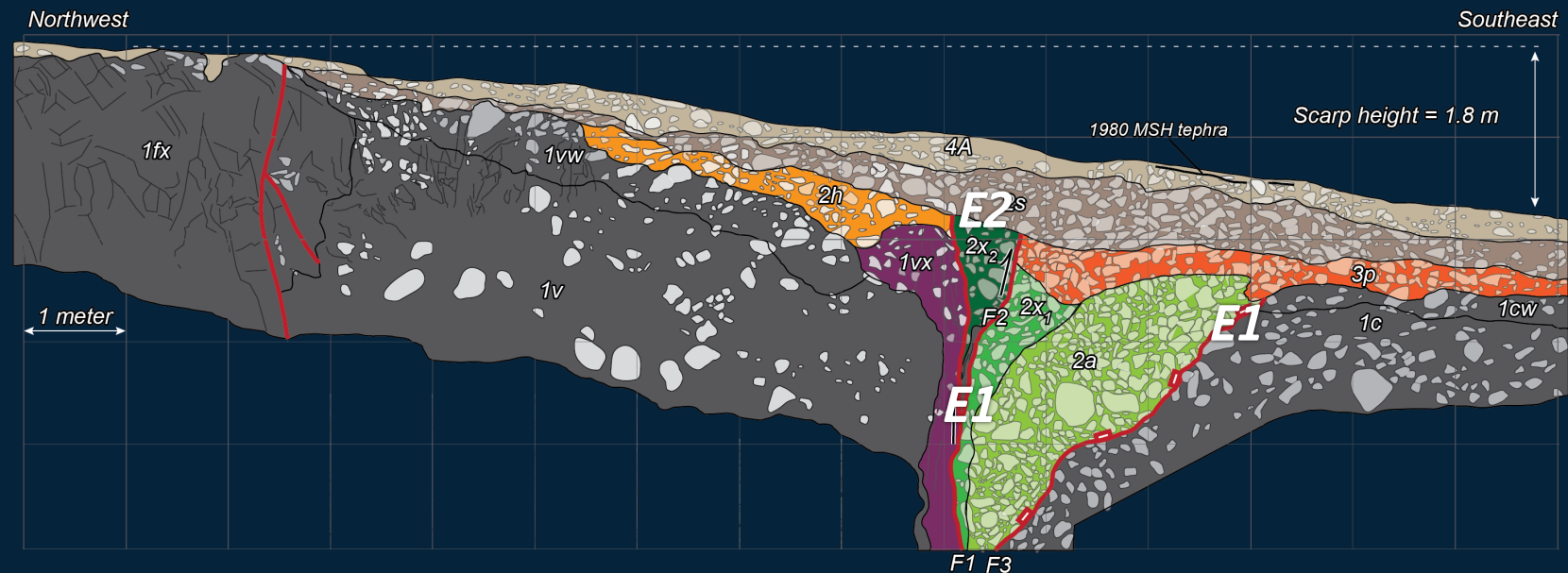


11.3 km

Trench at Boylston Mountains



Trench Log, Boylston Mountains Trench



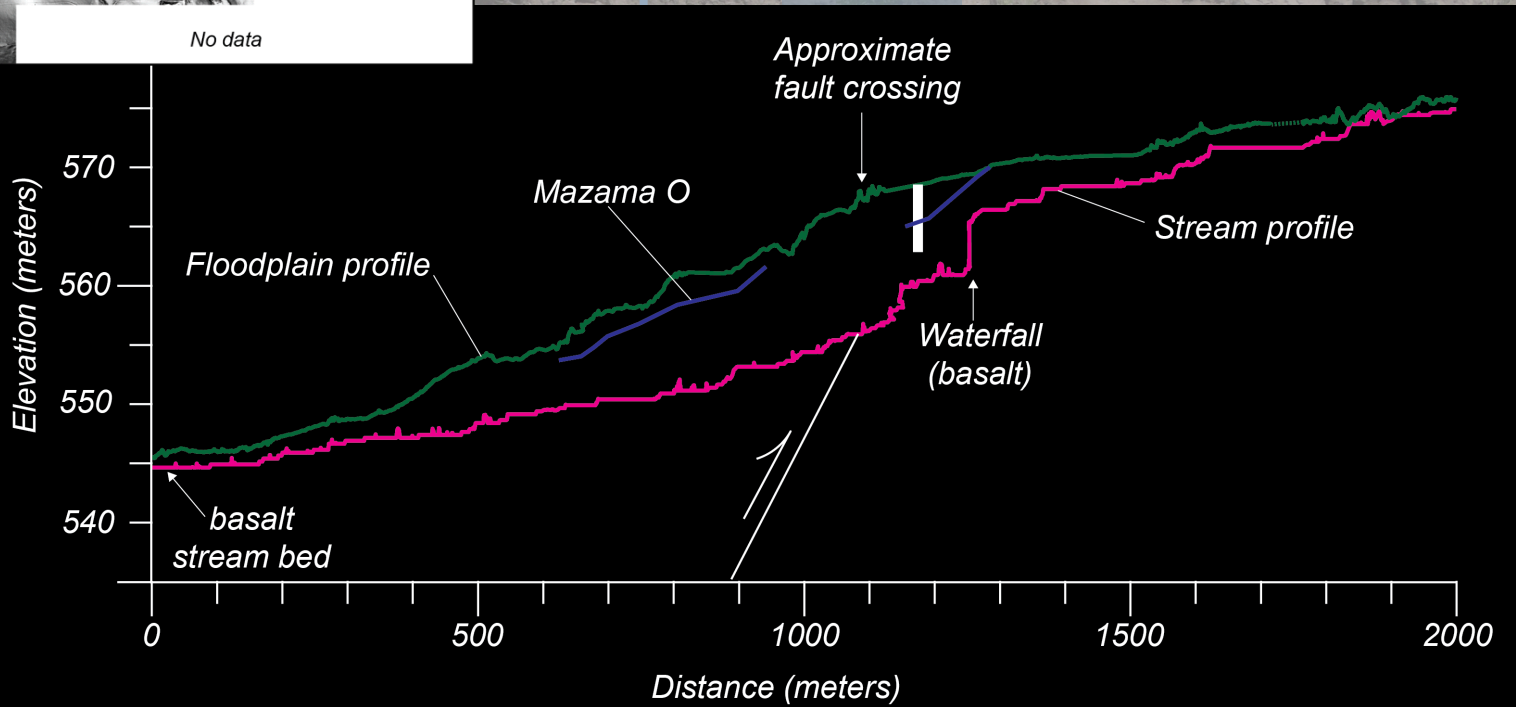
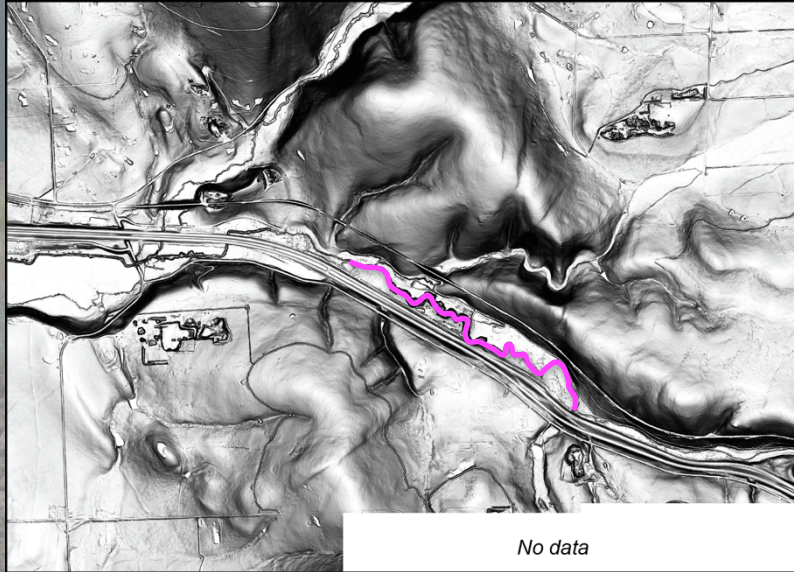
Explanation

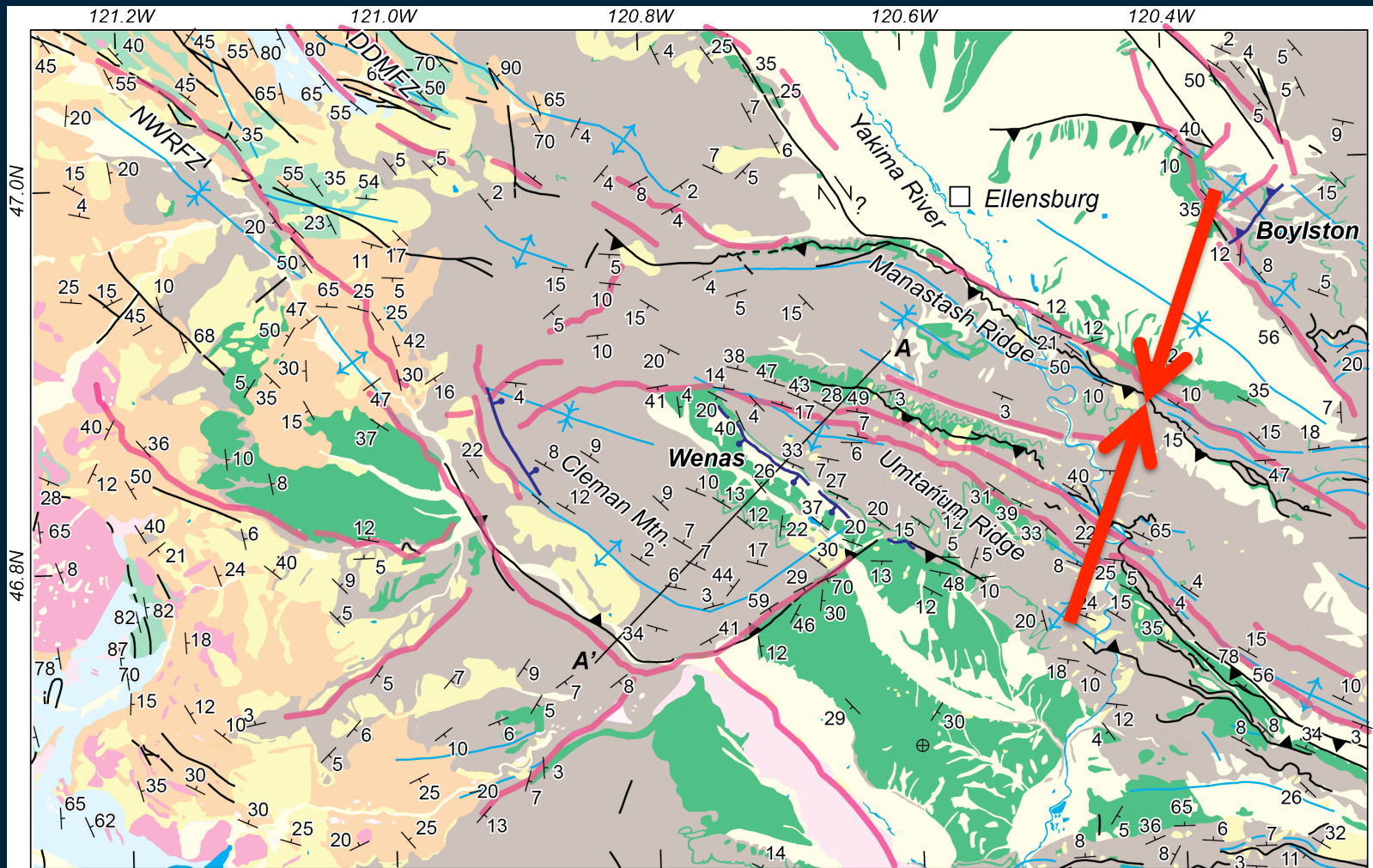
- Reverse fault, motion indicated
- Fissure boundary
- Fractures
- Basalt clast/block
- Contact

- 4A Modern soil
- 2s Scarp colluvium, undeformed
- 2x2 Colluvium from most recent earthquake
- 3p Buried soil bearing distinctive prismatic structure
- 2h Colluvium found only northwest of F1, integrates clasts of 1v and possibly eroded 3p
- 2x1 Colluvium from earthquake that pre-dates development of 3p
- 2a Colluvium from earthquake that pre-dates development of 3p
- 1cw Weathered top of 1c, or paleo C-Horizon
- 1c Brecciated, blocky, non-vesicular basalt, mapped as Grande Ronde Fm.
- 1vx Weathered, fractured 1v adjacent to F1. Fractures are sub-parallel to F1
- 1vw Weathered top of 1v, or paleo C-Horizon
- 1v Fractured, brecciated, vesicular, blocky basalt, mapped as Grande Ronde Fm.
- 1fx Jointed and fractured basalt, possibly colonnade of Grande Ronde Fm.

**Fault plane dips
~85 degrees NW
Grooves on the
fault plane indicate
RL oblique motion**

Stratigraphic Section at Fault Crossing in Johnson Canyon





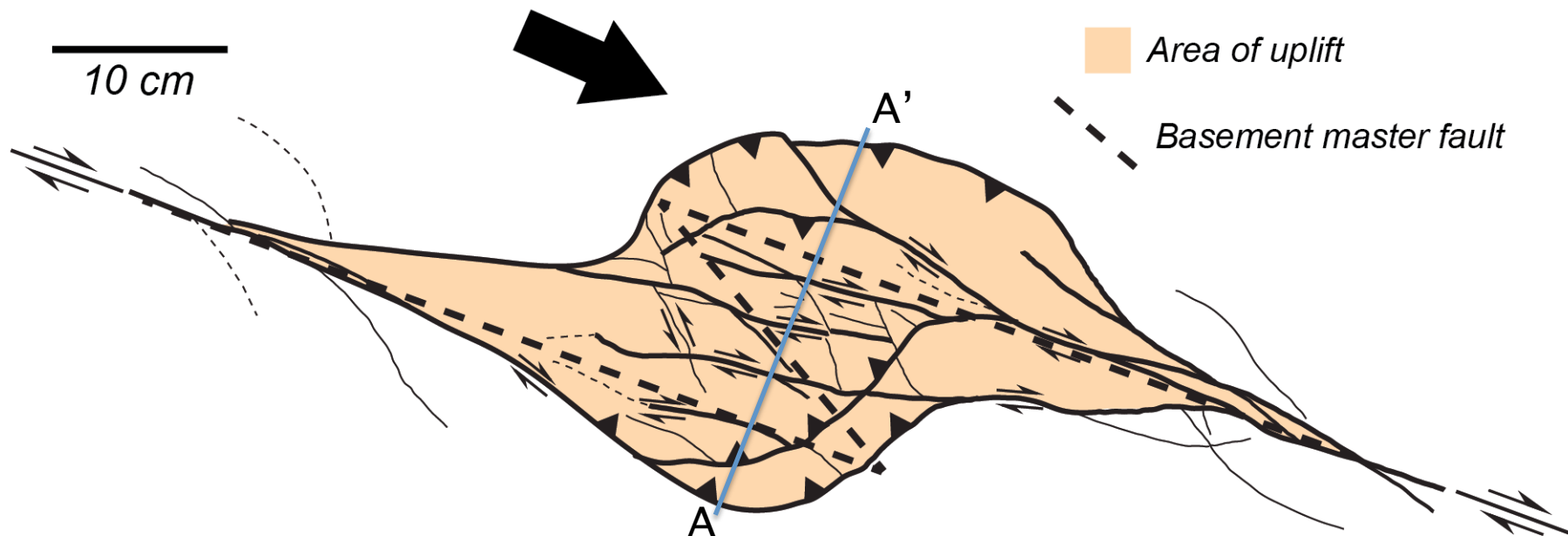
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|---|----------------|
| Faults | Folds |
| Magnetic lineament | Anticline axis |
| Reverse fault, barbs on upthrown side | Syncline axis |
| Scarps | |
| Normal fault scarp, bar and ball on downthrown side | |
| Reverse fault scarp, barbs on upthrown side | |
| 30° Strike and dip | |

Geology Legend

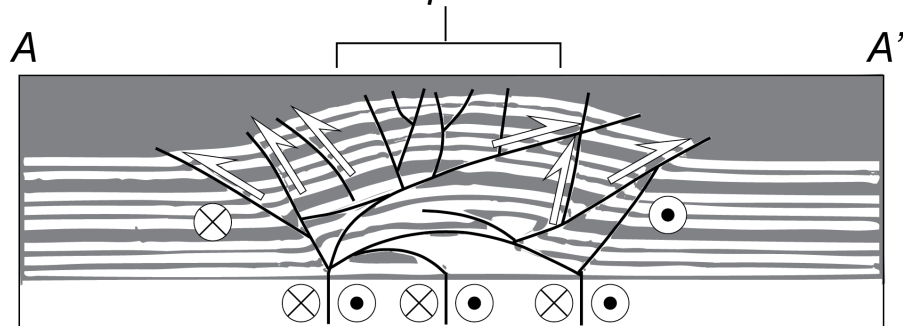
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|--------------------------------------|-----------------------------|
| Quaternary landslides | Columbia River Basalt Group |
| Quaternary sediments | Tertiary volcanic rocks |
| Quaternary volcanic rocks | Tertiary intrusive rocks |
| Pliocene - Miocene sedimentary rocks | Pre-Tertiary rocks |
| Other Tertiary sedimentary rocks | Water |

0 10 20 km





Several faults in center of pop-up structure have small amounts of normal displacement



Regional Interpretation of Trans-arc Fault System

